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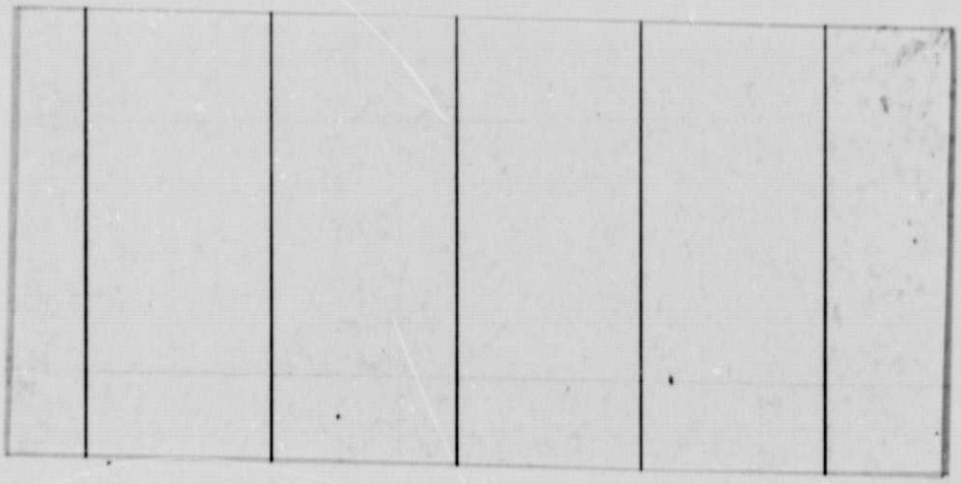

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College of Engineering

University of Florida

Gainesville

EVALUATION OF ATOMIC CONSTANTS

FOR

OPTICAL RADIATION

Final Report (Vol. I)

December 1974

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EVALUATION OF ATOMIC CONSTANTS

FOR

OPTICAL RADIATION

C. D. Kylstra
R. J. Schneider

University of Florida
Gainesville, Florida 32611

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PREFACE

The authors wish to thank NASA for sponsoring this work. The consulting guidance by Dr. Roger Bengtson on the equivalent electron problem is much appreciated. Also, the able assistance of graduate students, L. Ayers, K. Snyder, and J. Usher, and student assistant J. Daniels is gratefully acknowledged.

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INTRODUCTION

Both in the study of solar physics and laser transitions, atomic constants for optical radiation are needed. These include transition probabilities, line strengths, and oscillator strengths for both dipole and quadrupole transitions, as well as the associated Matrix elements needed for line broadening calculations. While the solar physicist is interested in all elements (but mainly in the low to medium atomic weight elements), the laser physicist is interested in selected elements and their ionic species.

The objective of this project was to compute the above mentioned atomic constants for a wider selection of elements and lines. An existing computer program developed by NASA[1*] was used, with modifications to include, in an approximate manner, the effect of equivalent electrons, and to enable reordering and restructuring of the output for publication. This program is suitable for fast, low cost computation of the optical constants, using the Coulomb approximation formalism for LS coupling.

The guidelines used for selecting lines for processing are:

a. Select approximately 10, 20, or 30 lines for each of the 24 elements, depending on the relative importance of the element.

b. Select only one line per multiplet.

c. Select the stronger lines for each element.

d. Originally, no equivalent electron lines were selected. Later, after the modification to the program was made to include the effects of equivalent electrons in an approximate manner, some equivalent electron lines were added.

e. Use the tables of Atomic Energy Levels by C. E. Moore[2] as the basic energy level reference.

f. Leave out energy levels with incomplete quantum number specifications.

*Reference numbers

These criteria, particularly items d and f, resulted in considerable numbers of lines being rejected by either the authors or the computer program. Since many lines involving equivalent electrons terminate in levels with n* (effective principle quantum number) approximately the same as ℓ (individual electron angular momentum quantum number), the (radial) transition integral equation developed by Bates and Damgaard will not converge[1,3]. This integral, by the way, is calculated using double precision on the IBM 370 to minimize numerical error problems. Of the original 24 selected elements, results were obtained for all but Neon. From the over 500 original lines, results were obtained for 372.

APPROACH

The details of the theory and the computer program are described in References 1 and 3, and thus there is no need to repeat the information here.

The modification of the program to approximately include equivalent electrons levels and their contributions to the atomic constants was accomplished under the guidance of Dr. Roger Bengtson. Only p type equivalent electrons are considered; all others are rejected by the program. Essentially, a table of Fractional Parentage[4] (Table I) is used to split an input energy level into three levels, each with a different parent and their associated L and S quantum numbers. Since the squares of the coefficients of Fractional Parentage are the probabilities of the various configurations, the matrix element for any allowed transition is multiplied by the squares of the coefficients of the upper and lower levels involved to get the most probable matrix elements, as well as the transition probability, line strength, and oscillator strength. All lines and matrix elements involving equivalent electrons are identified in the printout by an asterisk, so that the values affected by the approximations are indicated.

Another approximation was necessary for some of the elements in order to estimate a series limit for excited parent configurations. This consisted of adding to the series limit of the ground state the difference in energy between two equivalent levels for the ground state configuration and the excited parent configuration. Any series limit estimated by this approximation is indicated by an asterisk.

Input values for the energy levels came mainly from the tables compiled by Moore[2]. However, additional levels, when adequate information on quantum numbers was available, were also used.

TABLE I

FRACTIONAL PARENTAGE PROBABILITIES

Equivalent Electron Configuration	p^2	p^3	p^4	p^5
Term				
^4S	0. ^1S	0. ^1S	0. ^4S	0. ^1S
	1. ^2P	0. ^3P	1. ^2P	0. ^3P
	0. ^1D	0. ^1D	0. ^2D	0. ^1D
^2P	0. ^1S	.22222 ^1S	.33333 ^4S	.06667 ^1S
	1. ^2P	.5 ^3P	.24 ^2P	.6 ^3P
	0. ^1D	.27778 ^1D	.416667 ^2D	.3333 ^1D
^2D	0. ^1S	0. ^1S	0. ^4S	0. ^1S
	1. ^2P	.5 ^3P	.25 ^2P	0. ^3P
	0. ^1D	.5 ^1D	.75 ^2D	0. ^1D

RESULTS

The atomic constants of transition probability, line strength, oscillator strength, and the product of the statistical weigh (2J+1) and the oscillator strength are presented in Appendix A, for the 372 lines and the 23 elements. In Appendix B (contained in a separate volume), the dipole matrix elements associated with the lines, and the sum of all of the gradrupole matrix elements (for $\Delta L = 0$) are given. The definitions of the table headings, and special output indicators are included within the appendices.

CONCLUDING REMARKS

The accuracy of the atomic constants was checked against other sources when possible. In general, the agreement was good (i.e., $\pm$ 20% for transition probabilities). However, occasional values would differ by a factor of ten. Whether the values computed by the Coulomb approximation or by other methods are more correct is a manner of conjucture, and dependant on the specific case. However, the Coulomb approximation program is fast. Computer expenses to generate the results, including several reruns to eliminate troublesome lines, energy levels, etc., amounted to less than one thousand dollars.

REFERENCES

1. Shomo, L. P.; Oertel, G. D.; and Freer, C. S.: "A Method for the Calculation of Large Numbers of Dipole and Quadrupole Transition Probabilities," NASA TN D-5987, Nov. '70.

2. Moore, C. E." "Atomic Energy Levels" Vols. I, II, and III, NBS Circ. 467, 467, 467, U.S. Dep. of Com. June 15, 1949, Aug. 15, 1952, May 1, 1958.

3. Oertel, G. D.; and Shomo, L. P.: "Tables for the Calculation of the Radial Multipole Matrix Elements by the Coulomb Approximation." Astrophys, J., Suppl. Ser., Vol. 16, No. 145, Aug. 1968.

4. Slater, J. C., Quantum Theory of Atomic Structure, McGraw-Hill, New York, 1960.

APPENDIX A

ATOMIC CONSTANTS FOR SELECTED LINES

The tables in this appendix were generated after several steps of data processing. First, the Coulomb approximation program was run on an IBM 370 to obtain the basic results, which were punched on cards. A small IBM 1800 computer was used to sort and rearrange the card packets, which were then read by the BOOKPRINT program for printing on the IBM 370.

The organization and symbols used for headings in the following table are basically conventional nomenclature, with some changes as dictated by the output equipment.

The top line identifies the element, its atomic number, and its ionic state. The next lines indicate the number of parent configurations, their designation, and the series limit of each parent. If the series limit is estimated as discussed in the Approach section, an asterisk is printed out after the value.

The definitions of the headings for the main portion of the table are as follows:

W L AIR - The wavelength of the line in air at sea level in Angstrons. If the wavelength is less than 2000 Å, the vacuum wavelength is given.

SN F I - The sequence number (SN) assigned to the final (F) and initial (I) energy levels of the transition that produces the line. These sequence numbers indicate the energy levels in the matrix element tables (Appendix B). The sequence numbers are ordered with increasing value of the energy level.

PARENT - The designation of the Parent configuration associated with the line.

EE - If the line involves equivalent electrons, an asterisk is printed in this column.

DESIG F I - The designation of the final (F) and initial (I) states. Since the output equipment can't print lower case letters, all quantum numbers are upper case. Also, since half spacing is not available, superscripts and subscripts are all printed on the same line. Thus, using the 2829.073 He line as an example, the equivalences between the computer printout and the conventional nomenclature is

$$2S3S1.0 \equiv 2s\ ^3S_1$$

LEVEL F I - The energy levels of the final (F) and initial (I) levels.

A - The transition probability in sec^{-1}.

S - The line strength

F - The oscillator stength

GF - The oscillator strength multiplied by the statistical weigh (2J+1)

HELIUM ------- 2 ---- NEUTRAL

PARENT INFORMATION NO. DESIG LIMIT

1 (2S) 198305.000

W L AIR	SN	=	PARENT	EF	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
2829.077	1	23	(2S)		2S2S1.0	6P3P0.0	159850.312	195187.187	0.1775E+07	0.1987E-01	0.7106E-03	0.7106E-03
2845.104	1	19	(2S)		2S3S1.0	5P3P0.0	159850.312	193795.062	0.2934E+07	0.3709E-01	0.1274E-02	0.1274E-02
3187.743	1	17	(2S)		2S3S1.0	4P3P0.0	159850.312	191211.437	0.5154E+07	0.8832E-01	0.2642E-02	0.2642E-02
3447.592	2	26	(2S)		2S1S0.0	6P1P1.0	166271.687	195269.187	0.2250E+07	0.1373E+00	0.1209E-01	0.3629E-01
3611.641	2	22	(2S)		2S1S0.0	5P1P1.0	166271.687	193935.750	0.3777E+07	0.2643E+00	0.2222E-01	0.6666E-01
3705.083	3	28	(2S)		2P3P0.0	7D3D1.0	169082.187	196064.000	0.2212E+07	0.1668E+00	0.1367E-01	0.4101E-01
3819.606	3	24	(2S)		2P3P0.0	6D3D1.0	169082.187	195254.375	0.3605E+07	0.2979E+00	0.2367E-01	0.7102E-01
3388.646	1	7	(2S)		2S3S1.0	3P3P0.0	159850.312	185559.250	0.8812E+07	0.2561E+00	0.6654E-02	0.6654E-02
3964.727	2	16	(2S)		2S1S0.0	4P1P1.0	166271.687	191486.937	0.6883E+07	0.6360E+00	0.4870E-01	0.1461E+00
4009.273	4	29	(2S)		2P1P1.0	7D1D2.0	171129.125	196064.312	0.2966E+07	0.4723E+00	0.1192E-01	0.5961E-01
4026.363	3	20	(2S)		2P1P1.0	5D1D2.0	169082.187	193911.500	0.6506E+07	0.6207E+00	0.4748E-01	0.1424E+00
4121.312	3	17	(2S)		2P3P0.0	5S3S1.0	169082.187	193241.312	0.4682E+06	0.4458E-01	0.3575E-02	0.1072E-01
4143.754	4	25	(2S)		2P1P1.0	6D1D2.0	171129.125	195255.000	0.4893E+07	0.8602E+00	0.2101E-01	0.1050E+00
4287.930	4	21	(2S)		2P1P1.0	5D1D2.0	171129.125	193912.562	0.9011E+07	0.1881E+01	0.4339E-01	0.2169E+00
4437.551	4	18	(2S)		2P1P1.0	4S1S0.0	171129.125	192657.750	0.3261E+07	0.1439E+00	0.3212E-02	0.3212E-02
4471.477	3	14	(2S)		2P3P0.0	4D3D1.0	169082.187	191438.812	0.1379E+08	0.1824E+01	0.1252E+00	0.3725E+00
4713.145	3	11	(2S)		2P3P0.0	4S3S1.0	169082.187	190292.437	0.1018E+07	0.1574E+00	0.1014E-01	0.3041E-01
4921.933	4	15	(2S)		2P1P1.0	4D1D2.0	171129.125	191440.687	0.1990E+08	0.5863E+01	0.1265E+00	0.6027E+00
5015.676	2	10	(2S)		2S1S0.0	3P1P1.0	166271.687	186203.625	0.1319E+08	0.2467E+01	0.1493E+00	0.4479E+00
5047.734	4	12	(2S)		2P1P1.0	4S1S0.0	171129.125	190934.500	0.6729E+07	0.4277E+00	0.8574E-02	0.8574E-02
5876.988	3	8	(2S)		2P3P0.0	3D3D1.0	169082.187	186095.875	0.3968E+08	0.1193E+02	0.6156E+00	0.1859E+01
6078.148	4	9	(2S)		2P1P1.0	3D1D2.0	171129.125	186099.250	0.6372E+08	0.4647E+02	0.7193E+00	0.3551E+01
7065.187	3	5	(2S)		2P3P0.0	3S3S1.0	169082.187	183231.062	0.3229E+07	0.1584E+01	0.6807E-01	0.2042E+00
7281.349	4	6	(2S)		2P1P1.0	3S1S0.0	171129.125	184859.062	0.1812E+08	0.3456E+01	0.4803E-01	0.4803E-01
9467.667	5	19	(2S)		3S3S1.0	5P3P0.0	183231.062	193795.062	0.5596E+06	0.2344E+00	0.2506E-02	0.2506E-02
9603.500	6	26	(2S)		3S1S0.0	6P1P1.0	184859.062	195269.187	0.5849E+06	0.7680E+00	0.2428E-01	0.7284E-01
9702.660	7	27	(2S)		3P3P0.0	7S3S1.0	185559.250	195862.625	0.9514E+05	0.1288E+00	0.4031E-02	0.1209E-01
10833.301	1	3	(2S)		2S3S1.0	3P3P0.0	159850.312	169082.187	0.1033E+08	0.6481E+01	0.6056E-01	0.6056E-01

Table 1. Helium

LITHIUM ------ 3 ---- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1S)	43487.030

W L AIR	SN F	SN I	PARENT CF	DESIG F	DESIG I	LEVEL F	LEVEL I	A	-	=	GF
2377.550	1	19	(1S)	2S2S0.5	3P2P1.5	0.0	42118.000	0.1826E+06	0.2413E-02	0.1543E-03	0.3086E-03
2394.483	1	17	(1S)	2S2S0.5	8P2P1.5	0.0	41751.000	0.2627E+06	0.3564E-02	0.2260E-03	0.4519E-03
2425.683	1	16	(1S)	2S2S0.5	7P2P0.5	0.0	41217.000	0.3606E+06	0.5086E-02	0.3183E-03	0.6366E-03
2479.208	1	14	(1S)	2S2S0.5	6P2P0.5	0.0	40391.000	0.5267E+06	0.7883E-02	0.4614E-03	0.9669E-03
2562.537	1	11	(1S)	2S2S0.5	5P2P0.5	0.0	39016.000	0.7873E+06	0.1304E-01	0.7755E-03	0.1551E-02
2741.310	1	7	(1S)	2S2S0.5	4P2P0.5	0.0	36470.000	0.1139E+07	0.2319E-01	0.1284E-02	0.2569E-02
3232.610	1	4	(1S)	2S2S0.5	3P2P0.5	0.0	30925.000	0.8749E+06	0.2921E-01	0.1372E-02	0.2744E-02
3385.792	2	13	(1S)	2P2P0.5	6S2S0.5	14904.000	39988.000	0.8434E+06	0.5277E-01	0.2910E-02	0.4020E-02
4119.299	2	12	(1S)	2P2P0.5	5D2D1.5	14904.000	39094.000	0.9079E+07	0.1267E+01	0.4553E-01	0.1861E+00
4273.281	2	10	(1S)	2P2P0.5	5S2S0.5	14904.000	38299.000	0.1556E+07	0.1220E+00	0.4242E-02	0.4525E-02
4602.863	2	8	(1S)	2P2P0.5	4D2D1.5	14904.000	36623.000	0.1946E+06	0.3755E+01	0.1219E+00	0.4953E+00
4971.698	2	6	(1S)	2P2P0.5	4S2S0.5	14904.000	35012.000	0.3423E+07	0.4167E+00	0.1369E-01	0.2578E-01
6103.641	2	5	(1S)	2P2P0.5	3D2D1.5	14904.000	31283.000	0.5765E+08	0.2597E+02	0.6445E+00	0.2578E+01
6737.844	1	2	(1S)	2S2S0.5	2P2P0.5	0.0	14904.000	0.3709E+08	0.1106E+02	0.2503E+00	0.5007E+00
8126.526	2	3	(1S)	2P2P0.5	3S2S0.5	14904.000	27206.000	0.1110E+08	0.5883E+01	0.1140E+00	0.2280E+00
17513.352	4	15	(1S)	3P2P0.5	6D2D1.5	30925.000	40437.000	0.1640E+07	0.3764E+01	0.5476E-01	0.2174E+00
11032.102	4	13	(1S)	3P2P0.5	6S2S0.5	30925.000	39989.000	0.4865E+06	0.6447E+00	0.6472E-02	0.1774E-01
12237.699	4	12	(1S)	3P2P0.5	5D2D1.5	30925.000	39294.000	0.2896E+07	0.1049E+02	0.1301E+00	0.5206E+00
13557.801	4	10	(1S)	3P2P0.5	5S2S0.5	30925.000	38299.000	0.9400E+06	0.2315E+01	0.2592E-01	0.5184E-01
17546.102	4	8	(1S)	3P2P0.5	4D2D1.5	30925.000	36623.000	0.5662E+07	0.6045E+02	0.5230E+00	0.2092E+01
18793.102	5	9	(1S)	3D2D1.5	4F2F2.5	31283.000	36630.000	0.1291E+08	0.2501E+03	0.1015E+01	0.6092E+01
24484.699	4	6	(1S)	3P2P0.5	4S2S0.5	30925.000	35012.000	0.2484E+07	0.3593E+02	0.2210E+00	0.4460E+00
26877.801	3	4	(1S)	3S2S0.5	3P2P0.5	27206.000	30925.000	0.3730E+07	0.7161E+02	0.4044E+00	0.8098E+00

Table 2. Lithium

BERYLLIUM ---- 4 ---- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(2S)	75192.312
	2	(2P)	108252.530

W L AIR	F	SN I	PARENT SF	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
2232.720	1	14	(2S)	2P3P0.0	6S3S1.0	21979.000	71161.000	0.1225E+07	0.1525E-01	0.2279E-02	0.6836E-02
2256.520	1	12	(2S)	2P3P1.0	5D3D1.0	21979.000	70869.000	0.1154E+08	0.1487E+00	0.2196E-01	0.6587E-01
2494.559	1	6	(2S)	2P3P1.0	3D3D1.0	21979.000	62054.000	0.5772E+08	0.1328E+01	0.1617E+00	0.4850E+00
3151.386	1	4	(2S)	2P3P1.0	3S3S1.0	21979.000	52082.000	0.9292E+07	0.5343E+00	0.4628E-01	0.1388E+00
3321.340	2	4	(2S)	2P3P1.0	3S3S1.0	21980.000	52082.000	0.2784E+08	0.1512E+01	0.4607E-01	0.1382E+00
3515.549	3	12	(2S)	2P1P1.0	5D1D2.0	42565.000	71002.000	0.1547E+08	0.1661E+01	0.4791E-01	0.2395E+00
3776.280	3	11	(2S)	2P1P1.0	5S1S0.0	42565.000	69322.000	0.4269E+07	0.1103E+00	0.2958E-02	0.2958E-02
3813.417	3	10	(2S)	2P1P1.0	4D1D2.0	42565.000	68791.000	0.2702E+08	0.3703E+01	0.9926E-01	0.4913E+00
4407.910	3	8	(2S)	2P1P1.0	4S1S0.0	42565.000	65245.000	0.9692E+07	0.4102E+00	0.9418E-02	0.9418E-02
4572.672	3	7	(2S)	2P1P1.0	3D1D2.0	42565.000	64428.000	0.3346E+08	0.7911E+01	0.1751E+00	0.8753E+00
7209.133	4	9	(2S)	3S3S1.0	4P3P0.0	52082.000	65949.000	0.1622E+07	0.3373E+00	0.4736E-02	0.4736E-02
8254.102	3	5	(2S)	2P1P1.0	3S1S0.0	42565.000	54677.000	0.3847E+08	0.1069E+02	0.1311E+00	0.1311E+00

Table 3. Beryllium

BORON -------- 5 ---- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1S)	66930.000

W L AID	SN F	SN I	PARENT FE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
2497.730	1	2	(1S)	2P2P1.5	3S2S0.5	16.000	40040.000	0.6926E+08	0.1067E+01	0.3242E-01	0.6483E-01
8669.602	3	6	(1S)	3P2P0.5	5S2S0.5	48613.000	60146.000	0.1883E+07	0.1212E+01	0.2123E-01	0.4246E-01
11669.000	2	3	(1S)	3S2S0.5	3P2P0.5	40040.000	48613.000	0.1668E+08	0.2614E+02	0.3403E+00	0.6806E+00
15629.000	3	5	(1S)	3P2P0.5	4S2S0.5	48613.000	55009.000	0.5360E+07	0.2023E+02	0.1965E+00	0.3929E+00
16245.000	3	4	(1S)	3P2P0.5	3D2D1.5	48613.000	54765.000	0.1146E+08	0.9724E+02	0.9083E+00	0.3633E+01

Table 4. Boron

CARBON ------- 6 ---- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(2P)	90878.312

W - AIR	SN F	SN I	PARENT FE		DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
1261.560	2	20	(2P)	*	2P3P1.0	3D4P2.0	16.000	79311.000	0.0	0.0	0.0	0.0
1277.620	2	16	(2P)	*	2P3P1.0	3D3P1.0	16.000	78800.000	0.0	0.0	0.0	0.0
1280.340	1	15	(2P)	*	2P3P0.0	4S4P1.0	0.0	78117.000	0.0	0.0	0.0	0.0
1459.050	3	19	(2P)	*	2P1D2.0	3D1P1.0	10193.000	78727.000	0.0	0.0	0.0	0.0
1463.730	3	18	(2P)	*	2P1D2.0	3D1F1.0	10193.000	78531.000	0.0	0.0	0.0	0.0
1467.450	3	17	(2P)	*	2P1D2.0	4S1P1.0	10193.000	78338.000	0.0	0.0	0.0	0.0
1481.770	3	14	(2P)	*	2P1D2.0	3D1D2.0	10193.000	77660.000	0.0	0.0	0.0	0.0
1657.080	1	5	(2P)	*	2P3P2.0	3S2P1.0	0.0	60153.000	0.0	0.0	0.0	0.0
1751.900	4	19	(2P)	*	2P1S0.0	3D1P1.0	21648.000	78727.000	0.1859E+08	0.1480E+00	0.2556E-01	0.7698E-01
1930.930	3	7	(2P)	*	2P1D2.0	3S1P1.0	10193.000	61982.000	0.0	0.0	0.0	0.0
2474.573	4	7	(2P)	*	2P1S0.0	3S1P1.0	21648.000	61982.000	0.1300E+08	0.2935E+00	0.3595E-01	0.1079E+00
4268.988	7	27	(2P)		3S1P1.0	5P1D2.0	61982.000	95400.000	0.4153E+06	0.7984E-01	0.1992E-02	0.9462E-02
4371.329	7	26	(2P)		3S1P1.0	5P1P1.0	61982.000	84852.000	0.1212E+07	0.1501E+00	0.3475E-02	0.1042E-01
4932.000	7	24	(2P)		3S1P1.0	4P1S0.0	61982.000	82252.000	0.5251E+07	0.3117E+00	0.6398E-02	0.6389E-02
5041.560	6	21	(2P)		3S3P2.0	4P3D3.0	60393.000	80222.000	0.1726E+07	0.7694E+00	0.9217E-02	0.6452E-01
5062.121	7	23	(2P)		3S1P1.0	4P1D2.0	61982.000	81779.000	0.1317E+07	0.4256E+00	0.1345E-01	0.4214E-01
5141.242	7	22	(2P)		3S1P1.0	4P1P1.0	61982.000	80563.000	0.1386E+07	0.3201E+00	0.6021E-02	0.1806E-01
6587.750	8	25	(2P)		3P1P1.0	4D1P1.0	60858.000	84022.000	0.2537E+07	0.1076E+01	0.1652E-01	0.4957E-01
9315.191	7	13	(2P)		3S1P1.0	3P1S0.0	61982.000	73976.000	0.3421E+08	0.9791E+01	0.1189E+00	0.1189E+00
9394.891	6	12	(2P)		3S3P2.0	3P3P2.0	60393.000	71385.000	0.2052E+08	0.3415E+02	0.2547E+00	0.1274E+01
9459.488	6	11	(2P)		3S3P2.0	3P3S1.0	60393.000	70744.000	0.1296E+08	0.1731E+02	0.1038E+00	0.3264E+00
10548.000	8	17	(2P)		3P1P1.0	4S1P1.0	60858.000	78338.000	0.6612E+07	0.1150E+02	0.1197E+00	0.3310E+00
10691.199	6	10	(2P)		3S3P2.0	3P3D1.0	60393.000	69744.000	0.1745E+08	0.7378E+02	0.4190E+00	0.2933E+01
11333.398	8	14	(2P)		3P1P1.0	3D1D2.0	60858.000	77680.000	0.2176E+08	0.7826E+02	0.6993E+00	0.3494E+01
11894.898	9	15	(2P)		3P3D2.0	4S3P1.0	69710.000	78117.000	0.8499E+07	0.2119E+02	0.1082E+00	0.3246E+00

Table 5. Carbon

NITROGEN ----- 7 ---- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT	
	1	(3P)	117345.000	
	2	(1D)	131870.000	*

W L AIR	SN F	I	PARENT	EE	DESIG F	I	LEVEL F	I	A	S	F	SF
1100.700	3	29	(3P)	*	2P2D1.5	5S2P1.5	19231.000	110108.000	0.0	0.0	0.0	0.0
1163.880	3	23	(3P)	*	2P2D1.5	3D2D1.5	19231.000	105129.000	0.0	0.0	0.0	0.0
1167.450	2	21	(3P)	*	2P2D2.5	3D2F3.5	19223.000	104882.000	0.0	0.0	0.0	0.0
1176.400	3	18	(3P)	*	2P2D1.5	4S2P1.5	19231.000	104227.000	0.0	0.0	0.0	0.0
1199.550	1	7	(3P)	*	2P4S1.5	3S4P2.5	0.0	83355.000	0.0	0.0	0.0	0.0
1326.630	4	16	(3P)	*	2P2P0.5	4S2P1.5	28840.000	104227.000	0.0	0.0	0.0	0.0
1411.940	5	16	(1D)	*	2P2P0.5	3S2D1.5	28840.000	99558.000	0.0	0.0	0.0	0.0
1492.620	3	8	(3P)	*	2P2D1.5	3S2P1.5	19231.000	85223.000	0.0	0.0	0.0	0.0
1742.730	4	8	(3P)	*	2P2P0.5	3S2P1.5	29840.000	85223.000	0.0	0.0	0.0	0.0
4223.039	6	25	(3P)		3S4P1.5	4P4P1.5	83319.000	105993.000	0.9154E+05	0.1362E-01	0.2449E-03	0.9792E-03
4253.289	6	25	(3P)		3S4P1.5	4P4D2.5	83319.000	105515.000	0.1142E+06	0.2609E-01	0.4654E-03	0.1792E-02
4935.031	8	24	(3P)		3S2P1.5	4P2S0.5	86223.000	106473.000	0.1442E+07	0.1714E+00	0.2635E-02	0.5270E-02
6614.951	10	27	(3P)		3P4D0.5	5S4P0.5	94772.000	109813.000	0.2173E+07	0.6311E+00	0.1441E-01	0.2883E-01
6945.219	13	28	(3P)		3P4P2.5	5S4P2.5	95533.000	109927.000	0.1707E+07	0.1696E+01	0.1235E-01	0.7412E-01
7468.789	7	14	(3P)		3S4P2.5	3P4S1.5	83366.000	90751.000	0.1997E+08	0.1645E+02	0.1114E+00	0.4455E+00
8215.461	7	13	(3P)		3S4P2.5	3P4P2.5	83366.000	95533.000	0.2186E+08	0.3593E+02	0.2213E+00	0.1328E+01
8580.352	6	11	(3P)		3S4P1.5	3P4D2.5	83319.000	94832.000	0.1969E+08	0.3628E+02	0.3171E+00	0.1903E+01
9060.602	9	19	(3P)		3P2S0.5	3D2P1.5	93592.000	104515.000	0.2465E+08	0.3625E+02	0.6073E+00	0.2429E+01
9392.503	8	15	(3P)		3S2P1.5	3P2D2.5	85223.000	95854.000	0.2443E+08	0.6008E+02	0.4654E+00	0.2912E+01
9862.500	12	22	(3P)		3P4D3.5	3D4D3.5	94983.000	105020.000	0.8056E+07	0.3056E+02	0.1170E+00	0.9405E+00
10114.602	11	20	(3P)		3P4D2.5	3D4F3.5	94832.000	104718.000	0.3128E+08	0.1279E+03	0.6399E+00	0.5119E+01
11291.699	12	17	(3P)		3P4D3.5	4S4P2.5	94883.000	103736.000	0.1021E+09	0.4360E+02	0.1465E+00	0.8790E+00

Table 6. Nitrogen

OXYGEN ------- 8 ---- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(4S)	109836.587
	2	(2D)	136689.000

W L AIR	SN F	SN I	PARENT LE		DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	SF
988.777	1	12	(2D)	*	2P3P2.0	3S3D1.0	0.0	101155.000	0.0	0.0	0.0	0.0
1025.770	2	10	(4S)	*	2P3P2.0	3D3D1.0	0.0	97483.000	0.0	0.0	0.0	0.0
1152.160	3	15	(2D)	*	2P1D2.0	3S1D2.0	15867.000	102661.000	0.0	0.0	0.0	0.0
1302.170	2	5	(4S)	*	2P3P2.0	3S3S1.0	0.0	76794.000	0.0	0.0	0.0	0.0
4368.301	5	11	(4S)		3S3S1.0	4P3P0.0	76794.000	99590.000	0.6916E+06	0.2849E-01	0.6600E-03	0.6600E-03
5328.980	6	20	(4S)		3P5P1.0	5D5D0.0	86625.000	105385.000	0.2725E+07	0.2038E+00	0.3370E-02	0.3370E-02
5436.828	6	18	(4S)		3P5P1.0	6S5S2.0	86625.000	105019.000	0.7919E+06	0.3142E+00	0.5950E-02	0.2925E-01
5648.340	8	19	(4S)		3P3P0.0	6S3S1.0	88631.000	105164.000	0.3084E+06	0.1208E+00	0.9063E-02	0.1913E-01
6156.988	6	16	(4S)		3P5P1.0	4D5D0.0	86625.000	102865.000	0.7592E+07	0.8868E+00	0.1456E-01	0.1456E-01
6456.070	7	13	(4S)		3P5P2.0	5S5S2.0	86627.000	102116.000	0.2715E+07	0.1804E+01	0.1697E-01	0.3484E-01
7002.219	8	17	(4S)		3P3P0.0	4D3D1.0	88631.000	102908.000	0.1905E+07	0.9695E+00	0.4203E-01	0.1213E+00
7234.051	8	14	(4S)		3P3P0.0	5S3S1.0	88631.000	102811.000	0.7493E+06	0.4242E+00	0.1775E-01	0.5386E-01
7771.930	4	7	(4S)		3S5S2.0	3P5P2.0	73767.000	86527.000	0.3286E+08	0.3614E+02	0.3979E+00	0.4[illegible]E+01
8446.379	5	8	(4S)		3S3S1.0	3P3P0.0	76794.000	88531.000	0.3413E+08	0.6970E+01	0.1075E+00	0.1075E+00
9260.079	6	9	(4S)		3P5P1.0	3D5D0.0	86625.000	97420.000	0.4217E+08	0.1655E+02	0.1809E+00	0.1809E+00

Table 7. Oxygen

FLUORINE ----- 9 ---- NEUTRAL

PARENT INFORMATION

NO.	DESIG	LIMIT
1	(3P)	140553.500
2	(1D)	160525.000

W L AIR	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	SF
6239.641	1	11	(3P)	3S4P2.5	3P4S1.5	102406.000	118428.000	0.2768E+08	0.1329E+02	0.1078E+00	0.4312E+00
6345.500	2	11	(3P)	3S4P1.5	3P4S1.5	102681.000	118428.000	0.1752E+08	0.8862E+01	0.1054E+00	0.4238E+00
6870.219	3	7	(3P)	3S4P0.5	3P4D0.5	102641.000	117392.000	0.3599E+08	0.1154E+02	0.2549E+00	0.1050E+01
7037.469	4	12	(3P)	3S2P1.5	3P2P1.5	104731.000	119937.000	0.3689E+08	0.2542E+02	0.2741E+00	0.1095E+01
7311.020	4	10	(3P)	3S2P1.5	3P2S0.5	104731.000	118406.000	0.2625E+08	0.1014E+02	0.1052E+00	0.2153E+00
7425.641	2	6	(3P)	3S4P1.5	3P4P0.5	102681.000	115164.000	0.2590E+08	0.1172E+02	0.1198E+00	0.2396E+00
7607.172	4	9	(3P)	3S2P1.5	3P2D1.5	104731.000	117873.000	0.5919E+07	0.5151E+01	0.5139E-01	0.2056E+00
7754.699	4	8	(3P)	3S2P1.5	3P2D2.5	104731.000	117623.000	0.3353E+08	0.4636E+02	0.4537E+00	0.2722E+01
7800.219	5	9	(3P)	3S2P0.5	3P2D1.5	105057.000	117873.000	0.2745E+08	0.2675E+02	0.5012E+00	0.2003E+01

Table 8. Fluorine

SODIUM ------- II --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1S)	41449.648

W L AIR	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	SF
2512.128	1	21	(1S)	3S2S0.5	9P2P0.5	0.0	39794.551	0.2407E+05	0.3772E-03	0.227xE-04	0.4539E-04
2543.817	1	19	(1S)	3S2S0.5	8P2P0.5	0.0	39298.539	0.4103E+05	0.6076E-03	0.3986E-04	0.7959E-04
2593.927	1	16	(1S)	3S2S0.5	7P2P0.5	0.0	38540.398	0.7514E+05	0.1348E-02	0.7888E-04	0.1578E-03
2680.335	1	13	(1S)	3S2S0.5	6P2P0.5	0.0	37296.512	0.1758E+06	0.3347E-02	0.1695E-03	0.3791E-03
2852.828	1	9	(1S)	3S2S0.5	5P2P0.5	0.0	35040.270	0.5249E+06	0.1205E-01	0.5410E-03	0.1256E-02
2853.031	1	10	(1S)	3S2S0.5	5P2P1.5	0.0	35042.739	0.5250E+06	0.2410E-01	0.1282E-02	0.5129E-02
3302.323	1	5	(1S)	3S2S0.5	4P2P0.5	0.0	30266.679	0.2681E+07	0.9549E-01	0.4386E-02	0.8777E-02
3302.9x8	1	6	(1S)	3S2S0.5	4P2P1.5	0.0	30272.512	0.2683E+07	0.1910E+00	0.877cE-02	0.35t1E-01
4390.141	2	20	(1S)	3P2P0.5	8D2D1.5	16956.184	39729.000	0.7784E+06	0.1302E+00	0.4561E-02	0.1800E-01
4494.265	2	18	(1S)	3P2P0.5	7D2D1.5	16956.184	39230.965	0.1216E+07	0.21d3E+00	0.7372E-02	0.2949E-01
4497.72x	3	18	(1S)	3P2P1.5	7D2D1.5	16973.379	39200.955	0.2427E+06	0.4365E-01	0.7366E-03	0.2947E-02
4541.672	2	17	(1S)	3P2P0.5	8S2S0.5	16956.184	38958.352	0.3690E+06	0.3416E-01	0.1142E-02	0.2284E-02
4654.859	2	15	(1S)	3P2P0.5	6D2D1.5	16956.184	38387.301	0.2983E+07	0.4180E+00	0.1360E-01	0.5441E-01
4688.59x	3	15	(1S)	3P2P1.5	6D2D1.5	16973.379	38387.301	0.4155E+06	0.83c0E-01	0.1359E-02	0.5435E-0c
4745.015	2	14	(1S)	3P2P0.5	7S2S0.5	16956.184	38012.074	0.6095E+06	0.6446E-01	0.2061E-02	0.8123E-02
4978.585	2	12	(1S)	3P2P0.5	5D2D1.5	16956.184	37036.805	0.4077E+07	0.9944E+00	0.3032E-01	0.1213E+00
4982.844	3	12	(1S)	3P2P1.5	5D2D1.5	16973.379	37036.805	0.8132E+06	0.1969E+00	0.3029E-02	0.1212E-01
5149.090	2	11	(1S)	3P2P0.5	6S2S0.5	16956.184	36372.648	0.1117E+07	0.1507E+00	0.4442E-02	0.8884E-02
5153.84x	3	11	(1S)	3P2P1.5	6S2S0.5	16973.379	36372.648	0.2225E+07	0.3013E+00	0.4438E-02	0.8875E-02
5602.655	2	8	(1S)	3P2P0.5	4D2D1.5	16956.184	34548.799	0.1007E+08	0.3652E+01	0.9756E-01	0.3903E+00
5608.223	3	8	(1S)	3P2P1.5	4D2D1.5	16973.379	34548.799	0.2008E+07	0.7305E+00	0.9747E-02	0.3899E-01
5999.753	1	3	(1S)	3S2S0.5	3P2P1.5	0.0	16973.379	0.5681E+08	0.2370E+02	0.6122E+00	0.2449E+01
5895.922	1	2	(1S)	3S2S0.5	3P2P0.5	0.0	15956.184	0.5963E+06	0.1188E+02	0.3058E+00	0.1158E+03
6154.230	2	7	(1S)	3P2P0.5	5S2S0.5	16956.184	33200.895	0.2436E+07	0.5612E+00	0.1384E-01	0.2708E-01
6160.762	3	7	(1S)	3P2P1.5	5S2S0.5	16973.379	33200.895	0.4856E+07	0.1122E+01	0.1383E-01	0.2755E-01
8183.270	2	4	(1S)	3P2P0.5	3D2D1.5	16956.184	29172.855	0.4199E+08	0.4549E+02	0.8438E+00	0.3375E+01
8194.812	3	4	(1S)	3P2P1.5	3D2D1.5	16973.379	29172.855	0.8363E+07	0.9097E+01	0.8426E-01	0.3370E+00

Table 9. Sodium

Table 10. Magnesium

MAGNESIUM ---- 12 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
-	1	(2S)	61669.141

W L	SN		PARENT EE	DESIG		LEVEL		A	S	F	SF
AIR	F	I		F	I	F	I				
2628.630	1	26	(2S)	3P3P0.0	8D3D1.0	21850.000	59330.000	0.1924E+07	0.5183E-01	0.5982E-02	0.1795E-01
2658.110	1	24	(2S)	3P3P0.0	7D3D1.0	21850.000	59217.000	0.3500E+07	0.8448E-01	0.9512E-02	0.2854E-01
2732.030	1	22	(2S)	3P3P0.0	6D3D1.0	21850.000	58442.000	0.5093E+07	0.1340E+00	0.1711E-01	0.5133E-01
2846.750	1	17	(2S)	3P3P0.0	5D3D1.0	21850.000	55958.000	0.9646E+07	0.3299E+00	0.3519E-01	0.1056E+00
2852.129	2	17	(2S)	3P3P2.0	5D3D1.0	21911.000	56958.000	0.4798E+06	0.1650E-01	0.3512E-03	0.1054E-02
3091.077	1	12	(2S)	3P3P0.0	4D3D1.0	21850.000	54192.000	0.2178E+05	0.9532E+00	0.9367E-01	0.2810E+00
3329.930	1	9	(2S)	3P3P0.0	5S3S1.0	21850.000	51872.000	0.1597E+07	0.9291E-01	0.8471E-02	0.2541E-01
3829.350	1	8	(2S)	3P3P0.0	3D3D1.0	21850.000	47957.000	0.6922E+08	0.5763E+01	0.4569E+00	0.1371E+01
4057.632	3	25	(2S)	3P1P1.0	8D1D2.0	35051.000	59590.000	0.1593E+07	0.2795E+00	0.6970E-02	0.3485E-01
4167.391	3	23	(2S)	3P1P1.0	7D1D2.0	35051.000	59041.000	0.2199E+07	0.3933E+00	0.9550E-02	0.4775E-01
4351.910	3	21	(2S)	3P1P1.0	6D1D2.0	35051.000	58023.000	0.2656E+07	0.5414E+00	0.1059E-01	0.5295E-01
4703.020	3	16	(2S)	3P1P1.0	5D1D2.0	35051.000	56308.000	0.2405E+07	0.6181E+00	0.1330E-01	0.5550E-01
5167.344	1	4	(2S)	3P3P0.0	4S3S1.0	21850.000	41197.000	0.5991E+07	0.1430E+01	0.8402E-01	0.2521E+00
5528.461	3	11	(2S)	3P1P1.0	4D1D2.0	35051.000	53134.000	0.1516E+08	0.7559E+01	0.1369E+00	0.6942E+00
5711.113	3	10	(2S)	3P1P1.0	5S1S0.0	35051.000	52556.000	0.5533E+07	0.5694E+00	0.9026E-02	0.9025E-02
6318.551	4	18	(2S)	4S3S1.0	6P3P0.0	41197.000	57018.000	0.1848E+06	0.7711E-01	0.1235E-02	0.1235E-02
7657.602	4	13	(2S)	4S3S1.0	5P3P0.0	41197.000	54252.000	0.1596E+07	0.3764E+00	0.4974E-02	0.4974E-02
8806.769	3	6	(2S)	3P1P1.0	3D1D2.0	35051.000	46403.000	0.4165E+08	0.7062E+02	0.8115E+00	0.4058E+01
8923.569	5	15	(2S)	4S1S0.0	5P1P1.0	43503.000	54699.000	0.1114E+07	0.1176E+01	0.3998E-01	0.1199E+00
9257.693	6	19	(2S)	3D1D2.0	5F1F3.0	46403.000	57204.000	0.1013E+08	0.2778E+02	0.1922E+00	0.1276E+01
10813.000	8	20	(2S)	3D3D1.0	5F3F2.0	47957.000	57204.000	0.6429E+07	0.2037E+02	0.1079E+00	0.9356E+00
10963.000	7	17	(2S)	4P3P0.0	5D3D1.0	47847.000	55958.000	0.2316E+07	0.4522E+01	0.1252E+00	0.3757E+00
12083.000	6	14	(2S)	3D1D2.0	4F1F3.0	46403.000	54676.000	0.2062E+08	0.1259E+03	0.5324E+00	0.4426E+01

Table 11. Aluminum

ALUMINUM ------ 13 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1S)	46279.000
	2	(3P)	86000.000

WL AIR	SN F	SN I	PARENT ZE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
2204.627	1	18	(1S)	3P2P0.5	7D2D1.5	0.0	45344.000	0.6923E+07	0.1467E+00	0.1010E-01	0.40[illegible]E-01
2257.999	1	16	(1S)	3P2P0.5	7S2S0.5	0.0	44273.000	0.3636E+07	0.4131E-01	0.2777E-02	0.55[illegible]E-02
2263.453	1	15	(1S)	3P2P0.5	6D2D1.5	0.0	44166.000	0.8533E+07	0.1979E+00	0.1327E-01	0.53[illegible]E-01
2367.052	1	11	(1S)	3P2P0.5	5D2D1.5	0.0	42233.000	0.6127E+07	0.1606E+00	0.[illegible]E-01	0.41[illegible]E-01
2373.362	2	11	(1S)	3P2P1.5	5D2D1.5	112.000	42233.000	0.1216E+07	0.3213E-01	0.1027E-02	0.41[illegible]E-02
2376.408	2	10	(1S)	3P2P1.5	6S2S0.5	112.000	42144.000	0.1182E+08	0.1573E+00	0.5016E-02	0.1004E-01
2567.987	1	8	(1S)	3P2P0.5	4D2D1.5	0.0	38929.000	0.8310E+06	0.2762E-01	0.1644E-02	0.6577E-02
2575.103	2	8	(1S)	3P2P1.5	4D2D1.5	112.000	38929.000	0.1646E+05	0.5564E-02	0.1640E-03	0.65[illegible]E-03
2652.489	1	7	(1S)	3P2P0.5	5S2S0.5	0.0	37689.000	0.1106E+09	0.2042E+00	0.1170E-01	0.2340E-01
2660.393	2	7	(1S)	3P2P1.5	5S2S0.5	112.000	37689.000	0.2197E+08	0.4090E+00	0.1167E-01	0.2333E-01
3082.155	1	4	(1S)	3P2P0.5	3D2D1.5	0.0	32435.000	0.1473E+09	0.[illegible]E+01	0.4199E+00	0.1[illegible]E+01
3092.713	2	4	(1S)	3P2P1.5	3D2D1.5	112.000	32435.000	0.2916E+08	0.1705E+01	0.4165E-01	0.1674E+00
3944.032	1	3	(1S)	3P2P0.5	4S2S0.5	0.0	25347.000	0.2822E+08	0.1711E+01	0.6[illegible]E-01	0.13[illegible]E+00
3961.527	2	3	(1S)	3P2P1.5	4S2S0.5	112.000	25347.000	0.5559E+05	0.3[illegible]E+01	0.65[illegible]E-0[illegible]	0.[illegible]E+00
[illegible]	3	12	(1S)	4S2S0.5	6P2P0.5	25347.000	43334.000	0.5233E+06	0.5[illegible]E-01	0.[illegible]E-02	0.[illegible]E-02
6695.967	3	9	(1S)	4S2S0.5	5P2P1.5	25347.000	40277.000	0.1361E+07	0.77[illegible]E+00	0.1750E-01	0.70[illegible]E-01
7362.30[illegible]	4	19	(1S)	3D2D1.5	7F2F2.5	32435.000	46015.000	0.3315E+07	0.4158E+01	0.4267E-01	0.[illegible]572E+00
7835.323	4	17	(1S)	3D2D1.5	6F2F2.5	32435.000	45194.000	0.5632E+07	0.6033E+01	0.7781E-01	0.4559E+00
8055.985	6	18	(1S)	4P2P0.5	7D2D1.5	32949.000	45344.000	0.3603E+06	0.4006E+00	0.7540E-02	0.30[illegible]E-01
8772.873	4	13	(1S)	3D2D1.5	5F2F2.5	32435.000	43831.000	0.5786E+07	0.1959E+02	0.1645E+00	0.1017E+01
8773.910	5	13	(1S)	3D2D2.5	5F2F2.5	32436.000	43831.000	0.6588E+05	0.1399E+01	0.6070E-02	0.4542E-01
8774.559	5	14	(1S)	3D2D2.5	5F2F3.5	32436.000	43831.000	0.1048E+06	0.2798E+02	0.1614E+00	0.1291E+01
88[illegible].910	6	16	(1S)	4P2P0.5	7S2S0.5	32949.000	44273.000	0.7262E+05	0.4939E+00	0.8492E-02	0.1698E-01
8912.879	6	15	(1S)	4P2P0.5	6D2D1.5	32949.000	44166.000	0.1771E+06	0.2479E+00	0.4222E-02	0.1689E-01

SILICON ------ 14 --- NEUTRAL

PARENT INFORMATION NO. DESIG LIMIT

1 (2P) 65743.000

W L AIR	SN F	SN I	PARENT	EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
2058.130	4	19	(2P)	*	3P1D2.0	5S1P1.0	6298.609	54870.953	0.1917E+08	0.2345E+00	0.5931E-02	0.207[illegible]E-01
2122.59[illegible]	4	15	(2P)	*	3P1D2.0	3D1P1.0	6298.609	53387.172	0.1594E+07	0.2261E-01	0.6447E-03	0.1[illegible]E-02
2216.910	2	11	(2P)	*	3P3P1.0	3D3D2.0	77.150	45293.602	0.4632E+08	0.1290E+01	0.590[illegible]E-01	0.2953E+00
2216.660	3	12	(2P)	*	3P3P2.0	3D3D3.0	223.310	45321.859	0.6392E+08	0.2465E+01	0.65[illegible]E-01	0.461[illegible]E+00
2435.160	4	13	(2P)	*	3P1D2.0	3D1D2.0	6298.609	47351.500	0.2693E+08	0.9610E+00	0.2349E-01	0.11[illegible]E+00
2514.333	1	7	(2P)	*	3P3P0.0	4S3P1.0	0.0	39760.199	0.1066E+08	0.2513E+00	0.3034E-01	0.9103E-01
2532.330	5	19	(2P)	*	3P1S0.0	5S1P1.0	15394.238	54870.983	0.3969E+07	0.9506E-01	0.1152E-01	0.3455E-01
2631.310	5	18	(2P)	*	3P1S0.0	3D1P1.0	15394.238	53387.172	0.4107E+08	0.1109E+01	0.1280E+00	0.3840E+00
2881.590	4	9	(2P)	*	3P1D2.0	4S1P1.0	6298.609	40991.738	0.5207E+08	0.1847E+01	0.38[illegible]E-01	0.11[illegible]E+00
3905.530	5	9	(2P)	*	3P1S0.0	4S1P1.0	15394.238	40991.738	0.1058E+08	0.9342E+00	0.7261E-01	0.2178E+00
5645.60[illegible]	7	21	(2P)		4S3P1.0	5P3P2.0	39760.199	57468.180	0.7389E+06	0.3265E+00	0.5886E-02	0.2944E-01
5760.441	8	21	(2P)		4S3P2.0	5P3P2.0	39955.121	57468.180	0.2144E+07	0.9655E+00	0.1043E-01	0.5241E-01
5780.44[illegible]	6	20	(2P)		4S3P0.0	5P3D1.0	39683.102	56978.000	0.6740E+06	0.1956E+00	0.1014E-01	0.3041E-01
5949.573	[illegible]	22	(2P)		4S1P1.0	5P1D2.0	40991.738	57797.820	0.3568E+07	0.2022E+01	0.3440E-01	0.17[illegible]E+00
6254.[illegible]	12	[illegible]	(2P)		3D3D3.0	5F3F4.0	45321.859	61304.500	0.3146E+05	0.1502E-01	0.[illegible]E-03	[illegible]E-03
7003.[illegible]	15	30	(2P)		4P3D2.0	6D3F3.0	48102.379	62370.680	0.1615E+07	0.2157E+01	[illegible]	[illegible]
7165.821	13	28	(2P)		3D1D2.0	5F1D2.0	47351.500	61303.231	0.1561E+07	0.1425E+01	0.1[illegible]E-01	0.5011E-01
7405.852	10	24	(2P)		3D3D[illegible].0	4F3F2.0	45270.199	58775.441	0.9762E+07	0.9757E+01	0.1339E+00	0.66[illegible]E+00
7423.53[illegible]	12	25	(2P)		3D3D[illegible].0	4F3F3.0	45321.859	58786.501	0.1261E+07	0.1614E+01	0.1[illegible]E-01	0.7410E-01
7918.379	14	26	(2P)		4P3D1.0	5D3F2.0	46020.000	60645.488	0.3997E+07	0.4504E+01	0.[illegible]67E-01	0.5153E+00
7943.941	16	27	(2P)		4P3D3.0	5D3F4.0	45254.352	60849.129	0.4713E+07	0.1051E+02	0.5737E-01	0.5153E+00
8556.6[illegible]1	11	20	(2P)		3D3D2.0	5P3D1.0	45293.602	56978.000	0.[illegible]787E+0[illegible]	0.4445E-01	0.[illegible]54[illegible]E-03	0.[illegible]43E-03
8752.172	13	23	(2P)		3D1D2.0	4F1F3.0	47351.500	58774.180	0.1547E+0[illegible]	0.3587E+02	0.2485E+00	0.1742E+0[illegible]
9413.590	9	17	(2P)		4S1P1.0	4P1S0.0	40991.738	51611.770	0.2692E+08	0.1110E+02	0.1[illegible]53E+00	0.1153E+00

Table 12. Silicon

PHOSPHORUS --- 15 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1D)	106518.000
	2	(3P)	68560.000

W L AIR	SN F	SN I	PARENT EE		DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
1774.990	1	9	(3P)	*	3P4S1.5	4S4P2.5	0.0	56339.680	0.0	0.0	0.0	0.0
1659.430	2	12	(1D)	*	3P2D1.5	4S2D1.5	11361.699	65150.602	0.0	0.0	0.0	0.0
2130.180	3	11	(3P)	*	3P2D1.5	4S2P1.5	11361.699	58174.398	0.0	0.0	0.0	0.0
2149.140	3	10	(3P)	*	3P2D1.5	4S2P3.5	11361.699	57876.801	0.0	0.0	0.0	0.0
2154.080	5	12	(1D)	*	3P2P1.5	4S2D1.5	18741.192	65150.602	0.0	0.0	0.0	0.0
2535.650	6	11	(3P)	*	3P2P1.5	4S2P1.5	18741.192	58174.398	0.1745E+08	0.5624E+00	0.1683E-01	0.5734E-01
2553.280	4	10	(3P)	*	3P2P0.5	4S2P3.5	18722.398	57876.801	0.1367E+08	0.2250E+00	0.1337E-01	0.2675E-01
9525.761	9	16	(3P)		4S4P2.5	4P4S1.5	56339.680	66834.500	0.1105E+08	0.1886E+02	0.1003E+00	0.4012E+00
9593.537	7	14	(3P)		4S4P0.5	4P4P1.5	55939.230	66360.157	0.5039E+07	0.1578E+02	0.2496E+00	0.9984E+00
9750.733	8	13	(3P)		4S4P1.5	4P4P0.5	55090.590	66343.375	0.1722E+08	0.1578E+02	0.1228E+00	0.2456E+00
9796.799	9	15	(3P)		4S4P2.5	4P4P2.5	56339.680	66544.125	0.1426E+08	0.3975E+02	0.2053E+00	0.1232E+01

Table 13. Phosphorus

SULPHUR ------ 16 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(4S)	83559.312
	2	(2D)	97305.000
	3	(2P)	100518.000

W L AIR	SN F	I	PARENT EE		DESIG F	I	LEVEL F	I	A	S	F	GF
1295.660	1	21	(2P)	*	3P3P2.0	4S3P2.0	0.0	77161.000	0.0	0.0	0.0	0.0
1303.420	2	20	(4S)	*	3P3P2.0	6S3S1.0	0.0	76720.000	0.0	0.0	0.0	0.0
1316.570	2	18	(4S)	*	3P3P2.0	4D3D1.0	0.0	75952.000	0.0	0.0	0.0	0.0
1401.540	2	14	(4S)	*	3P3P2.0	5S3S1.0	0.0	71352.000	0.0	0.0	0.0	0.0
1425.109	2	13	(4S)	*	3P3P2.0	3D3D1.0	0.0	70165.000	0.0	0.0	0.0	0.0
1440.250	4	25	(2P)	*	3P1D2.0	4S1P1.0	9239.000	78290.000	0.0	0.0	0.0	0.0
1474.010	3	12	(2D)	*	3P3P2.0	4S3D2.0	0.0	67825.000	0.0	0.0	0.0	0.0
1782.260	5	25	(2P)	*	3P1S0.0	4S1P1.0	22181.000	78290.000	0.0	0.0	0.0	0.0
1807.340	2	7	(4S)	*	3P3P2.0	4S3S1.0	0.0	55331.000	0.0	0.0	0.0	0.0
4694.149	6	15	(4S)		4S5S2.0	5P5P2.0	52623.000	73913.000	0.1222E+07	0.3125E+00	0.4042E 02	0.2021E-01
5276.609	7	16	(4S)		4S3S1.0	5P3P0.0	55331.000	74209.000	0.1566E+06	0.4120E-01	0.7896E 03	0.7895E-03
5666.102	6	31	(4S)		4P5P1.0	9S5S2.0	63446.000	81281.000	0.2536E+06	0.1105E+00	0.1994E 02	0.9971E-02
5856.929	5	30	(4S)		4P5P1.0	7S5D0.0	63446.000	80995.000	0.2161E+07	0.1574E+00	0.3507E 02	0.3507E-02
6041.930	8	29	(4S)		4P5P1.0	6S5D0.0	63446.000	79992.000	0.3496E+07	0.3511E+00	0.6783E 02	0.6783E-02
6052.629	10	26	(4S)		4P5P3.0	6D5D2.0	63475.000	79992.000	0.2316E+06	0.1270E+00	0.9101E 03	0.4551E-02
6403.578	8	27	(4S)		4P5P1.0	7S5S2.0	63446.000	79058.000	0.6763E+06	0.4386E+00	0.6934E 02	0.3467E-01
6743.578	8	22	(4S)		4P5P1.0	5D5D0.0	63446.000	78270.000	0.6033E+07	0.9145E+00	0.1578E 01	0.1372E 01
6748.739	9	23	(4S)		4P5P2.0	5D5D1.0	63497.000	78270.000	0.1505E+07	0.6859E+00	0.8170E 02	0.1861E-01
6757.102	10	24	(4S)		4P5P3.0	5D5D2.0	63475.000	78270.000	0.3999E+06	0.3648E+00	0.1957E 02	0.9783E-02
7244.770	11	28	(4S)		4P3P0.0	5D3D1.0	64891.000	78892.000	0.1506E+07	0.6487E+00	0.3557E 01	0.1067E+00
7679.602	8	19	(4S)		4P5P1.0	6S5S2.0	63446.000	76464.000	0.1331E+07	0.1489E+01	0.1962E 01	0.9811E-01
8449.570	11	20	(4S)		4P3P0.0	6S3S1.0	64891.000	76720.000	0.6530E+06	0.5844E+00	0.2094E 01	0.5298E-01
8670.648	8	17	(4S)		4P5P1.0	4D5D0.0	63446.000	74973.000	0.9926E+07	0.3200E+01	0.3734E 01	0.3734E-01
9035.922	11	18	(4S)		4P3P0.0	4D3D1.0	64891.000	75952.000	0.1172E+07	0.1282E+01	0.4306E 01	0.1292E+00
9212.910	6	10	(4S)		4S5S2.0	4P5P3.0	52623.000	73475.000	0.2603E+08	0.7040E+02	0.6640E+00	0.3248E+01

CHLORINE ----- 17 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1D)	113627.000
	2	(3P)	104991.000

W L	SN	PARENT CE		DESIG		LEVEL		A	S	F	GF
AIn	F I			F	I	F	I				
11e8.770	1 12	(1D)	*	3P2P1.5	4S2D1.5	0.0	84115.000	0.0	0.0	0.0	0.0
1261.360	3 12	(1D)	*	3P2P0.5	4S2D1.5	861.000	84115.000	0.0	0.0	0.0	0.0
1347.240	2 7	(3P)	*	3P2P1.5	4S2P0.5	0.0	74221.000	0.0	0.0	0.0	0.0
4307.762	4 19	(3P)		4S4P0.5	5P4D0.5	71954.000	94727.000	[illegible]	0.1509E+00	[illegible]	[illegible]
4525.211	7 20	(3P)		4S2P0.5	5P2P0.5	74221.000	96308.000	0.5984E+07	0.5488E+00	0.1839E-01	0.3679E-01
6140.259	9 21	(3P)		4P4P0.5	5D4D0.5	82914.000	99196.000	0.6667E+07	0.1356E+01	0.3431E-01	0.5863E-01
7256.648	4 17	(3P)		4S4P0.5	4P4S1.5	71954.000	85730.000	0.7605E+07	0.5745E+01	0.1402E+00	0.4807E+00
7547.090	5 17	(3P)		4S4P1.5	4P4S1.5	72484.000	85730.000	0.1352E+08	0.1149E+02	0.2156E+00	0.4562E+00
8333.309	5 14	(3P)		4S4P1.5	4P4D2.5	72484.000	84480.000	0.2246E+08	0.3055E+02	0.3512E+00	0.2107E+01
8375.969	4 11	(3P)		4S4P0.5	4P4D0.5	71954.000	83889.000	0.2634E+08	0.1530E+02	0.2772E+00	0.5545E+00
8428.270	6 15	(3P)		4S4P2.5	4P4D3.5	72822.000	84684.000	0.3103E+08	0.7344E+02	0.4409E+00	0.3967E+01
8575.270	6 14	(3P)		4S4P2.5	4P4D2.5	72822.000	84480.000	0.8536E+07	0.1052E+02	0.9749E-01	0.5849E+00
8585.988	5 13	(3P)		4S4P1.5	4P4D1.5	72484.000	84127.000	0.1565E+08	0.1958E+02	0.1732E+00	0.6924E+00
9702.301	6 10	(3P)		4S4P2.5	4P4P1.5	72822.000	83126.000	0.9528E+07	0.1694E+02	0.5837E-01	0.3535E+00
9868.461	12 18	(1D)		4S2D1.5	4P2P0.5	84115.000	94309.000	0.2353E+08	0.2175E+02	0.1053E+00	0.3257E+00
9875.949	8 16	(3P)		4S2P1.5	4P2D2.5	74861.000	84984.000	0.2207E+08	0.6304E+02	0.4845E+00	0.2907E+01

ARGON -------- 18 --- NEUTRAL

PARENT INFORMATION NO. DESIG LIMIT

1 (2P) 127109.875

# L / A1R	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
4836.691	3	9	(2P)	4P3S1.0	9S3P0.0	104102.125	124771.625	0.1575E+06	0.8807E-02	0.1843E-03	0.1843E-03
5048.807	3	7	(2P)	4P3S1.0	8S3P0.0	104102.125	123903.312	0.2519E+06	0.1602E-01	0.3211E-03	0.3211E-03
5421.352	3	7	(2P)	4P3D1.0	8S3P0.0	105462.812	123903.312	0.1131E+07	0.8907E-01	0.1663E-02	0.1953E-02
8115.309	1	4	(2P)	4S3P0.0	4P3D1.0	93143.812	105462.812	0.2656E+06	0.2104E+00	0.7472E-02	0.2362E-01
8521.441	2	6	(2P)	4S1P1.0	4P1P1.0	95399.875	107131.750	0.3095E+08	0.2639E+02	0.3371E+00	0.1011E+01
9224.500	2	5	(2P)	4S1P1.0	4P1D2.0	95399.875	106237.625	0.2506E+08	0.4859E+02	0.5331E+00	0.2666E+01

Table 16. Argon

POTASSIUM ---- I9 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1S)	35009.781

* L AIR	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
3034.820	1	13	(1S)	4S2S0.5	9P2P0.5	0.0	32940.340	0.2143E+05	0.5922E-03	0.2962E-04	0.5924E-04
3102.793	1	12	(1S)	4S2S0.5	8P2P0.5	0.0	32227.422	0.4322E+05	0.1275E-02	0.6239E-04	0.1248E-03
3217.155	1	10	(1S)	4S2S0.5	7P2P0.5	0.0	31069.980	0.1043E+06	0.3435E-02	0.1621E-03	0.3241E-03
3445.372	1	8	(1S)	4S2S0.5	6P2P0.5	0.0	29039.269	0.3248E+06	0.1315E-01	0.5791E-03	0.1158E-02
4044.140	1	6	(1S)	4S2S0.5	5P2P1.5	0.0	24720.199	0.1051E+07	0.2159E+00	0.8104E-02	0.1621E-01
4047.201	1	5	(1S)	4S2S0.5	5P2P0.5	0.0	24701.441	0.1048E+07	0.1080E+00	0.4049E-02	0.8095E-02
5782.602	2	9	(1S)	4P2P0.5	7S2S0.5	12985.172	30274.262	0.1167E+07	0.2230E+00	0.5853E-02	0.1171E-01
5861.901	3	9	(1S)	4P2P1.5	7S2S0.5	13042.891	30274.262	0.2310E+07	0.4459E+00	0.5b33E-02	0.1167E-01
6911.301	2	7	(1S)	4P2P0.5	6S2S0.5	12985.172	27450.648	0.2596E+07	0.7816E+00	0.1717E-01	0.3434E-01
6938.980	3	7	(1S)	4P2P1.5	6S2S0.5	13042.891	27450.648	0.4735E+07	0.1564E+01	0.1710E-01	0.3421E-01
7664.906	1	3	(1S)	4S2S0.5	4P2P1.5	0.0	13042.891	0.3628E+08	0.3229E+02	0.8395E+00	0.2558E+01
7698.980	1	2	(1S)	4S2S0.5	4P2P0.5	0.0	12985.172	0.3580E+08	0.1615E+02	0.3183E+00	0.5367E+00
9950.560	4	11	(1S)	5S2S0.5	7P2P1.5	21026.801	31074.461	0.1178E+06	0.2294E+00	0.3500E 02	0.1400E-01
9955.199	4	10	(1S)	5S2S0.5	7P2P0.5	21026.801	31069.980	0.1176E+06	0.1147E+00	0.1749E 02	0.3498E-02

Table 17. Potassium

CALCIUM ------ 20 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(2S)	49304.61
	2	(2D)	63685.00

A L AIR	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	UF
3130.003	1	20	(2S)	4P3P0.0	8D3D1.0	15157.000	47036.000	0.3114E+07	0.1424E+00	0.1378E-01	0.4134E-01
3180.515	3	18	(2S)	4P3P2.0	9S3S1.0	15315.000	46748.000	0.8689E+06	0.4144E-01	0.7914E-03	0.2373E-02
3209.930	1	17	(2S)	4P3P0.0	7D3D1.0	15157.000	46302.000	0.5520E+07	0.2707E+00	0.2560E-01	0.7680E-01
3274.661	2	16	(2S)	4P3P1.0	8S3S1.0	15210.000	45735.000	0.8664E+06	0.4015E-01	0.1426E-02	0.4279E-02
3408.476	1	15	(2S)	4P3P0.0	7S3S1.0	15157.000	43980.000	0.5622E+06	0.3478E-01	0.3644E-02	0.9132E-02
3675.307	4	21	(2S)	3D3D2.0	8F3F2.0	20349.000	47550.000	0.0	0.0	0.0	0.0
3753.367	5	19	(2S)	3D3D3.0	7F3F2.0	20370.000	47006.000	0.0	0.0	0.0	0.0
3957.053	2	11	(2S)	4P3P1.0	6S3S1.0	15210.000	40474.000	0.3656E+07	0.3542E+00	0.9059E-02	0.2718E-01
4425.441	1	10	(2S)	4P3P0.0	4D3D1.0	15157.000	37748.000	0.3579E+08	0.4598E+01	0.3155E+00	0.9464E+00
4526.934	6	14	(2S)	3D1D2.0	6P1P1.0	21849.000	43933.000	0.0	0.0	0.0	0.0
4585.871	5	12	(2S)	3D3D3.0	4F3F2.0	20370.000	42170.000	0.0	0.0	0.0	0.0
5183.871	7	13	(2S)	4P1P1.0	5D1D2.0	23652.000	42919.000	0.1772E+08	0.6117E+01	0.1193E+00	0.5955E+00
6102.723	1	8	(2S)	4P3P0.0	5S3S1.0	15157.000	31539.000	0.4548E+07	0.1533E+01	0.7024E-01	0.2207E+00
6169.051	4	9	(2S)	3D3D2.0	5P3P1.0	20349.000	36554.000	0.0	0.0	0.0	0.0

Table 18. Calcium

RUBIDIUM ----- 37 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1S)	33691.020

W L AIR	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	G*
4201.852	1	5	(1S)	5S2S0.5	6P2P1.5	0.0	23792.091	0.2500E+07	0.3666E+00	0.1324E-01	0.5297E-01
4215.555	1	4	(1S)	5S2S0.5	6P2P0.5	0.0	23715.191	0.2475E+07	0.1833E+00	0.6600E-02	0.1320E-01
5040.093	2	9	(1S)	5P2P0.5	7D2D1.5	12578.961	32280.160	0.1370E+07	0.4900E+00	0.1317E-01	0.5278E-01
5704.453	3	9	(1S)	5P2P1.5	7D2D1.5	12816.559	30280.160	0.2642E+06	0.9799E-01	0.1299E-02	0.5197E-02
6200.309	2	8	(1S)	5P2P0.5	6D2D1.5	12578.961	28687.148	0.1671E+07	0.6846E+00	0.2162E-01	0.8649E-01
6298.328	3	8	(1S)	5P2P1.5	6D2D1.5	12816.559	28687.148	0.3578E+06	0.1768E+00	0.2130E-02	0.8521E-02
7279.995	2	7	(1S)	5P2P0.5	7S2S0.5	12578.961	26311.461	0.2286E+07	0.8719E+00	0.1818E-01	0.3636E-01
7406.172	3	7	(1S)	5P2P1.5	7S2S0.5	12816.559	26311.461	0.4340E+07	0.1744E+01	0.1787E-01	0.3573E-01
7516.934	2	6	(1S)	5P2P0.5	5D2D1.5	12578.961	25700.559	0.1391E+07	0.1216E+01	0.2423E-01	0.9693E-01
7800.227	1	3	(1S)	5S2S0.5	5P2P1.5	0.0	12816.559	0.3636E+08	0.3411E+02	0.6638E+00	0.2655E+01
7947.602	1	2	(1S)	5S2S0.5	5P2P0.5	0.0	12578.961	0.3437E+08	0.1705E+02	0.3257E+00	0.5515E+00

Table 19. Rubidium

STRONTIUM ---- 38 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT	
	1	(2S)	45925.602	
	2	(2D)	46773.602	*

W L AIR	F	I	SN	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
4832.074	1	8	(2S)		5P3P0.0	5D3D1.0	14317.520	35006.941	0.2340E+08	0.3915E+01	0.2460E+00	0.7379E+00
4591.980	4	10	(2S)		4D3D3.0	4F3F2.0	19319.256	38750.453	0.0	0.0	0.0	0.0
4964.262	2	9	(2S)		5P3P2.0	5D3D3.0	14489.652	35045.055	0.3890E+08	0.1644E+02	0.2012E+00	0.1408E+01
5329.624	5	11	(2S)		4D1D2.0	7P1P1.0	20149.699	38906.898	0.0	0.0	0.0	0.0
6345.750	3	7	(2S)		4D3D2.0	6P3P2.0	18218.797	33973.082	0.0	0.0	0.0	0.0
7070.102	2	6	(2S)		5P3P2.0	6S3S1.0	14698.562	29038.797	0.1938E+08	0.1015E+02	0.6720E-01	0.2616E+00

CESIUM -------- 55 ---- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(1S)	31406.711

W L AIR	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	G
4555.355	1	4	(1S)	6S2S0.5	7P2P1.5	0.0	21946.660	0.2396E+07	0.4477E+00	0.1492E-01	0.5968E-01
5663.801	2	9	(1S)	6P2P0.5	9D2D1.5	11176.238	28628.898	0.1947E+07	0.6942E+00	0.1874E-01	0.7495E-01
6586.503	3	8	(1S)	6P2P1.5	8S2S0.5	11732.352	26910.660	0.2102E+07	0.5936E+00	0.6640E-02	0.1326E-01
6763.277	2	7	(1S)	6P2P0.5	7D2D1.5	11176.238	26047.959	0.5946E+07	0.3572E+01	0.8065E-01	0.3226E+00
7609.020	2	6	(1S)	6P2P0.5	6S2S0.5	11176.238	24317.172	0.2323E+07	0.1011E+01	0.2018E-01	0.4036E-01
8521.102	1	3	(1S)	6S2S0.5	6P2P1.5	0.0	11732.352	0.3151E+08	0.3854E+02	0.6865E+00	0.2746E+01
8761.379	2	5	(1S)	6P2P0.5	6D2D1.5	11176.238	22588.891	0.1194E+08	0.1587E+02	0.2750E+00	0.1100E+01

Table 21. Cesium

BARIUM -------- 56 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(2S)	42032.398
	2	(2D)	47965.000

W L AIR	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
3993.404	1	18	(2S)	5D3D3.0	4F3F4.0	9596.551	34630.809	0.0	0.0	0.0	0.0
4283.109	2	19	(2S)	5D.D2.0	4F1F3.0	11395.383	34736.422	0.0	0.0	0.0	0.0
4493.841	5	20	(2S)	6P3P2.0	7D3D2.0	13514.738	35762.211	0.4616E+07	0.1035E+01	0.1399E-01	0.6993E-01
4619.977	3	17	(2S)	6P3P0.0	8S3S1.0	12266.020	33905.348	0.1214E+07	0.1774E+00	0.1166E-01	0.3473E-01
4673.621	1	16	(2S)	5D3D3.0	7P3P2.0	9596.551	30987.277	0.0	0.0	0.0	0.0
5159.918	6	25	(2S)	6P1P1.0	7D1D2.0	18060.266	37434.957	0.1900E+07	0.6451E+00	0.1265E-01	0.6326E-01
5267.031	6	24	(2S)	6P1P1.0	8S1S0.0	18060.266	37041.030	0.3502E+07	0.2529E+00	0.4859E-02	0.4859E-02
5535.551	4	14	(2S)	6P3P1.0	6D3D1.0	12636.617	30695.594	0.2296E+08	0.5775E+01	0.1056E+00	0.3167E+00
5777.664	5	15	(2S)	6P3P2.0	6D3D3.0	13514.738	30818.109	0.4647E+08	0.3234E+02	0.3395E+00	0.2379E+01
6771.652	8	27	(2D)	6P1D2.0	6D1D2.0	23074.414	37837.398	0.1666E+08	0.1276E+02	0.1146E+00	0.5730E+00
6867.971	7	26	(2D)	6P3F3.0	6D3F3.0	22947.437	37504.020	0.1007E+08	0.1129E+02	0.7129E-01	0.4991E+00
7636.652	8	22	(2D)	6P1D2.0	6D1F3.0	23074.414	36165.312	0.3416E+08	0.5263E+02	0.4184E+00	0.2929E+01
7842.879	9	23	(2D)	6P3F4.0	6D3G5.0	23757.078	36837.500	0.4651E+08	0.1129E+03	0.4982E+00	0.5480E+01
7905.719	5	11	(2S)	6P3P2.0	7S3S1.0	13514.738	26150.285	0.1615E+08	0.1183E+02	0.9081E-01	0.2726E+00
8213.238	6	13	(2S)	6P1P1.0	6D1D2.0	18060.266	30236.816	0.4892E+08	0.6416E+02	0.7969E+00	0.3954E+01
9713.770	10	21	(2D)	6P3P0.0	6D3D1.0	25042.156	35933.824	0.6904E+07	0.9383E+01	0.2932E+00	0.6797E+00
9830.371	6	12	(2S)	6P1P1.0	7S1S0.0	18060.266	28230.078	0.2461E+08	0.1165E+02	0.1199E+00	0.1199E+00

MERCURY ------ 80 --- NEUTRAL

PARENT INFORMATION	NO.	DESIG	LIMIT
	1	(2S)	84184.125
	2	(2D)	119692.000

W L AIR	SN F	SN I	PARENT EE	DESIG F	DESIG I	LEVEL F	LEVEL I	A	S	F	GF
2093.595	1	7	(2S)	6P3P1.0	6S3S1.0	39412.301	73961.312	0.1138E+08	0.4087E+00	0.1429E-01	0.4285E-01
3021.499	2	10	(2S)	6P3P2.0	7D3D3.0	44042.977	77129.562	0.3332E+08	0.3160E+01	0.6390E-01	0.4473E+00
3131.833	1	5	(2S)	6P3P1.0	6D3D1.0	39412.301	71330.187	0.5274E+08	0.2401E+01	0.7760E-01	0.2328E+00
3050.145	2	6	(2S)	6P3P2.0	6D3D3.0	44042.977	71431.312	0.7993E+08	0.1345E+02	0.2237E+00	0.1566E+01
4347.593	3	9	(2S)	6P1P1.0	7D1D2.0	54068.781	77054.125	0.2417E+08	0.4908E+01	0.1142E+00	0.5712E+00
4358.352	1	4	(2S)	6P3P1.0	7S3S1.0	39412.301	62350.457	0.3337E+08	0.4096E+01	0.9510E-01	0.2663E+00
4916.035	3	8	(2S)	6P1P1.0	8S1S0.0	54068.781	74404.562	0.6904E+07	0.4053E+00	0.8344E-02	0.8344E-02
5460.754	2	4	(2S)	6P3P2.0	7S3S1.0	44042.977	62350.457	0.2828E+08	0.6827E+01	0.7500E-01	0.2277E+00

Table 23. Mercury